

1 July 26, 2011

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8
9 Marlene H. Dortch, Secretary

10 Federal Communications Commission

11 445 12th Street SW

12 Washington, DC 20554

13 Re: IB Docket No. 11-109

14 Dear Ms. Dortch,

15 I have serious concerns about LightSquared's proposal for a nationwide 4G
16 LTE system. I'm afraid that neither LightSquared nor the FCC fully
17 understands the impact of LightSquared's proposed system on GPS
18 receivers, America's small businesses, and America's economy.

19 As a Contributing Editor to GPS World magazine, my specialty is high-
20 precision GPS receivers of which I've been involved with for more than 20
21 years as a product developer, power user and consultant. I'm in touch with
22 tens of thousands of high-precision GPS users from around the world
23 through my newsletter articles (bi-weekly), webinars and my attendance at
24 technical conferences. I consider myself and I'm considered by others to be
25 an advocate for the high-precision GPS community.

26 Hundreds of thousands of high-precision GPS receivers in the U.S. are used
27 across many market segments including civil/environmental engineering,
28 construction, land surveying, Geographic Information Systems (GIS),
29 agriculture, forestry, road/rail/airport, hydrography, environmental,
30 water/gas/electric/oil/telecom utilities, mining, bridge/dam monitoring,

emergency management, defense & intelligence, higher education, and all levels of Fed/State/Local government.

To illustrate, allow me to describe some examples of how high-precision GPS is being used.

In road construction, high-precision GPS offers a 5-to-1 efficiency advantage over legacy construction equipment. Can you imagine the delays if road construction projects took five times longer to complete?

California's Department of Transportation (CALTRANS) currently has 846 construction projects ongoing with construction costs of ~\$10.5 billion.

High-precision GPS receivers are a critical component of these projects.

Projects such as the widening project pictured below, are completed way ahead of schedule. For this reason, CALTRANS has invested in 250 high-precision GPS receivers valued at ~\$5 million (~\$20,000 per receiver).



CALTRANS Highway 101 project widened the route from four to six lanes to extend the carpool lane for two and a half miles and upgrade a congested interchange in Santa Rosa - six months ahead of schedule.

It's not just large, high-precision GPS receiver deployments that matter. GPS keeps the public safe.

In Florida, the 5.5 mile Sunshine Skyway Bridge spanning Tampa Bay has five high-precision GPS receivers permanently mounted on it so engineers can monitor the health of the structure. On an annual basis, more than 18

52 million vehicles travel over the bridge. High-precision GPS is a core
53 technology that ensures the safety of those 18 million vehicles.



54
55 The structural integrity of the Sunshine Skyway Bridge over Tampa Bay is continuously monitored by high-
56 precision GPS receivers, ensuring the safety of more than 18 million vehicles per year.

57 It's not just thousands of public entities that are invested in high-precision
58 GPS technology. Tens of thousands of U.S. small businesses rely on high-
59 precision GPS technology in their daily operations.

60 A small land surveying firm owner in Virginia says:

61 *"I have relied on GPS for survey grade data for at least 15 years. We use GPS*
62 *every day for all projects. If GPS becomes unavailable or unreliable it will just*
63 *about put us out of business. Our \$500,000 investment would become*
64 *worthless. "*

65 A four-person agricultural drainage firm owner states:

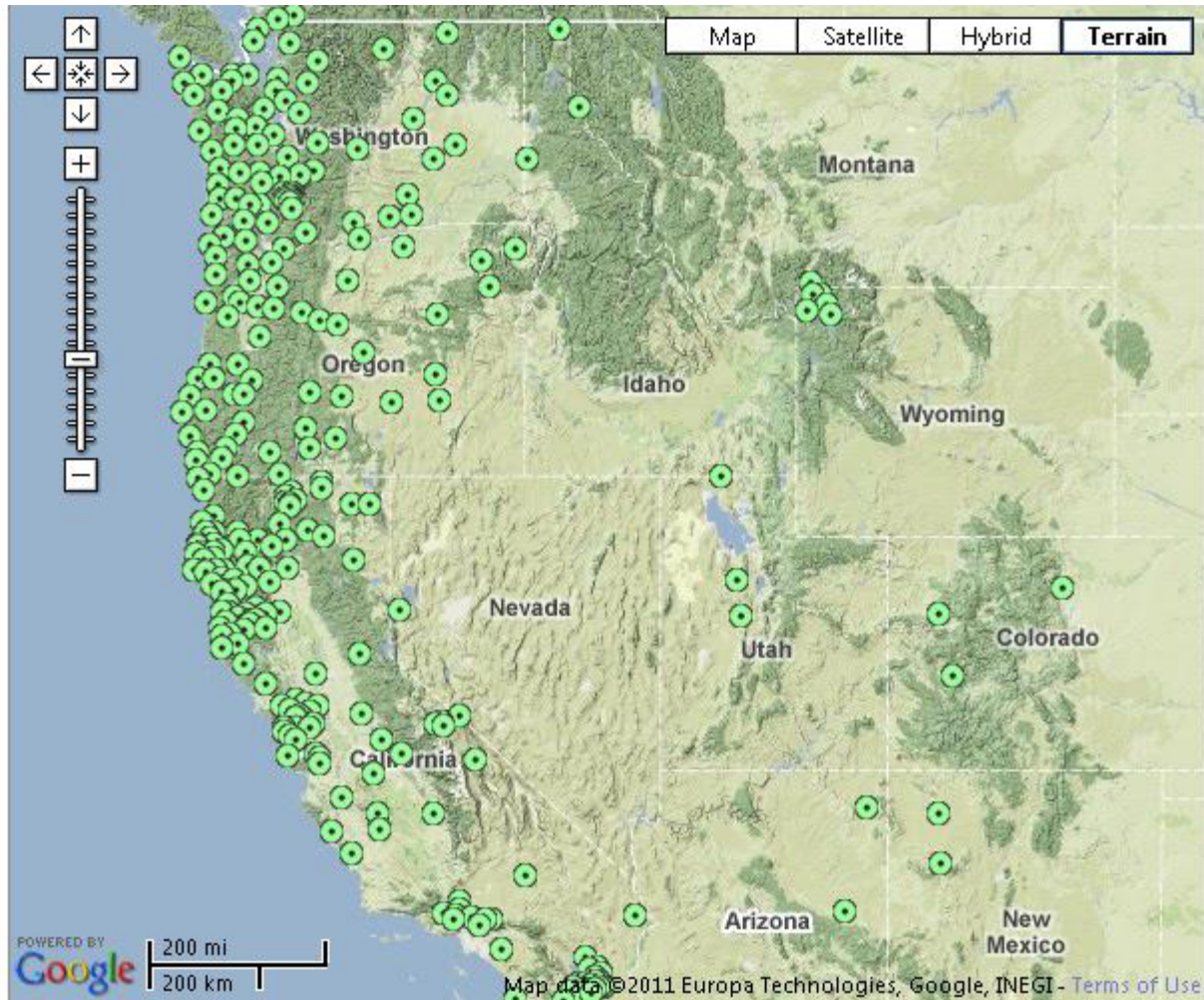
66 *"I am president of a small business that relies solely on high accuracy GPS.*
67 *We do GPS Ag drainage (I and three other employees) we set a base on site*
68 *all over the state because close proximity RTK correction is the only way to*
69 *get the vertical accuracy required to do what we do. Any GPS interference*
70 *immediately closes my business and puts four people out of work."*

71 Another small land surveying firm says:

72 *"High precision GPS allows us to obtain measurements between monuments*
73 *which are miles apart to control land boundaries ... in a couple of hours that*
74 *20 years ago would required 20 to 30 hours of field crew time. The change in*
75 *technology comes with our investment of approximately \$100,000 which is*
76 *very significant for a small firm like ours. If we are to wake up here in the*
77 *next year and find our equipment useless for high precision GPS, the affects*
78 *would be devastating to us and our clients in both private development and*
79 *public infrastructure."*

80 Finally, high-precision GPS users rely on a complex infrastructure of 7,000+
81 high-precision, fixed-mount GPS base stations deployed nationwide. The
82 infrastructure began with a few receivers in the early 1990's and has been
83 built upon over the past 18 years by the GPS user community volunteering
84 time, money, equipment, and expertise. It would be impossible to replace
85 all of these receivers since the ownership is so disparate. Many are publicly-
86 owned and the rest are commercially-owned by businesses and used by
87 people in all market segments I listed above. To illustrate, one such network
88 consisting of over 875 high-precision GPS receivers is located in the
89 western United States managed by UNAVCO, a university-governed
90 consortium which is sponsored by the National Science Foundation (NSF),
91 National Aeronautics and Space Administration (NASA), US Geological
92 Survey (USGS), National Oceanographic and Atmospheric Administration
93 (NOAA).

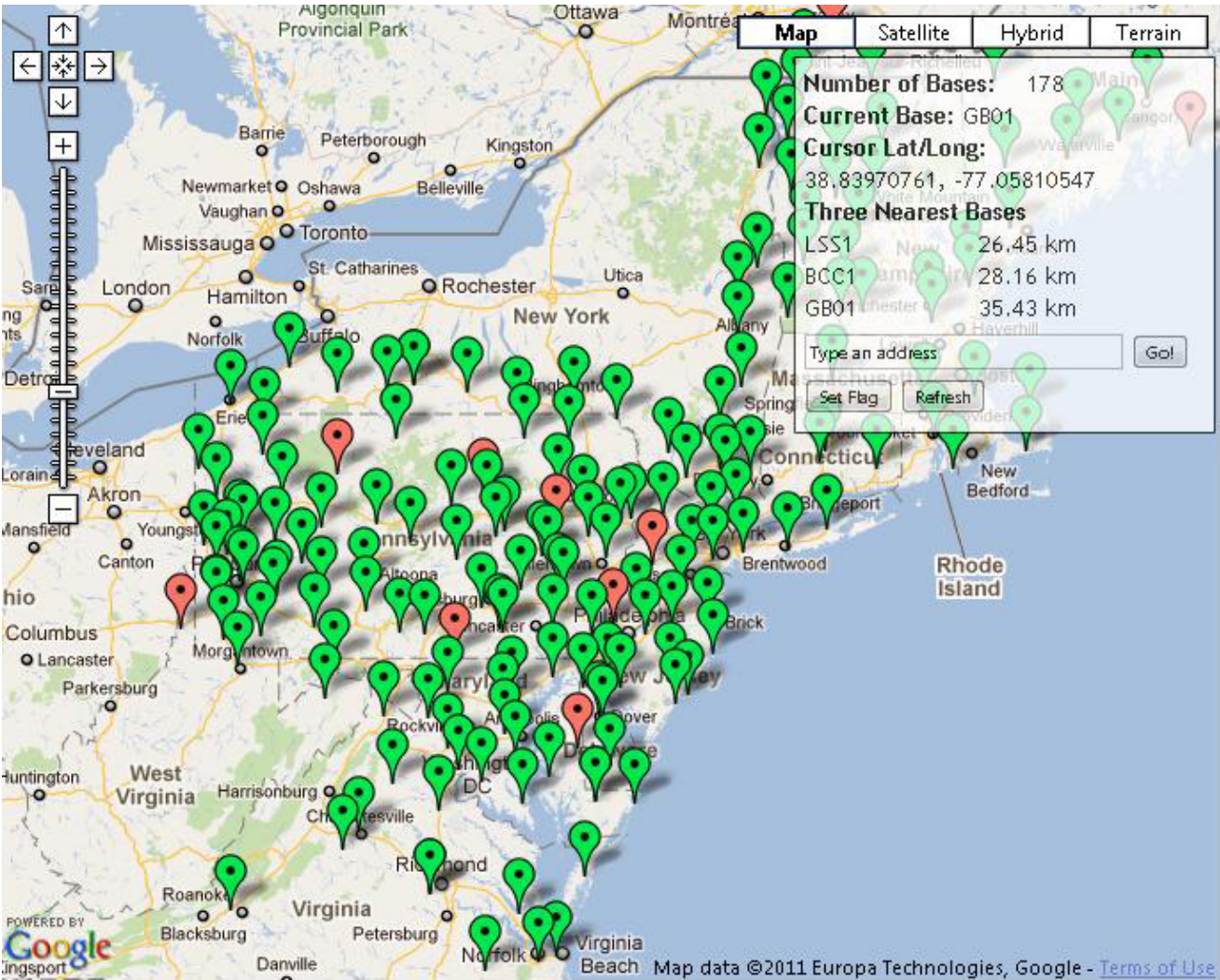
94 UNAVCO uses this massive network of high-precision GPS receivers to,
95 among other things; monitor the earth's crustal plate movement (think
96 earthquake monitoring).



Each dot represents a permanently-mounted high-precision GPS receiver that continuously monitors the Earth's crustal plate movement

Another type of high-precision GPS network is called an RTK Network. It delivers real-time, high-precision corrections to engineers, surveyors, Geographic Information Systems (GIS) specialists, construction specialists, and others. This particular network, owned by Keystone Precision Instruments, consists of 178 fixed-mount, high-precision GPS receivers and delivers high-precision GPS corrections to users in New York, Pennsylvania, Maryland, Virginia, Delaware, New Jersey, Connecticut, Vermont, Massachusetts, Rhode Island, New Hampshire and Maine.

Like the UNAVCO network, the Keystone Precision Instrument RTK Network is a multi-million dollar investment in high-precision GPS infrastructure.



Keystone Precision Instruments' RTK Network diagram showing 178 fixed-mount, high-precision GPS receivers that provide high-precision GPS corrections to high-precision GPS users in the northeastern U.S.

Recommendations

I'm grateful for this 30-day public comment period as I think it will give the FCC and LightSquared a new perspective on the impact that disrupting high-precision GPS receivers would have on the GPS user community and America's economy.

Although I'm in favor of a nationwide 4G LTE system, I'm opposed to LightSquared's proposed plan for the following reasons:

1. **The GPS user community knew this was coming and chose to do nothing.** This is false. Contrary to what LightSquared asserts, the GPS user community did not know anything about this potential interference until November 2010. LightSquared and the FCC incorrectly assumed that communicating/negotiating with the U.S. GPS Industry Council (USGIC) was the equivalent of communicating/negotiating with the GPS user community. That is a false assumption. The USGIC does not communicate directly with the GPS user community and never has. That's not their role. I've been personally involved in the high-precision GPS industry for 20+ years and writing a monthly newsletter on high-precision GPS technology for GPS World magazine for more than five years. I attend almost every major GPS conference and high-precision GPS market segment conference in the U.S. and some abroad. The first I'd heard about the LightSquared interference issue was November 2010.

Furthermore, there is a clear precedent already set that demonstrates how to handle a case very similar to the current LightSquared situation. In 2008, the U.S. Air Force proposed to discontinue supporting the semicodeless technique that is used by virtually every civilian L1/L2 high-precision GPS receiver in existence. It was the first time in history that an action would render several hundred thousand high-precision GPS receivers obsolete, a scale which is very similar to the impact of the LightSquared system.

There was no industry coalition formed to engage the Air Force. There was no industry outcry. A public/private technical working group was

not formed to test the effects on receivers if semicodeless was not supported. Why is that?

The answer is very simple. The U.S. Air Force, to its credit, did a fantastic job of communicating directly with the GPS user community along with the Department of Commerce. It issued public statements describing the impact the action would have on high-precision GPS receivers.

The U.S. Air Force did its homework. At the end of the day, it set a sunset date of December 31, 2020 to discontinue supporting the semicodeless technique. It correctly determined that 12 years is about the amount of time that would allow a smooth transition with a manageable financial impact to the high-precision GPS user community.

Imagine if the U.S. Air Force had set a period of one year to transition away from using the semicodeless technique. That action would have destroyed the high-precision GPS user community resulting in billions of dollars in losses and widespread small business closure. Fortunately, they did their homework, understood the impact, and made the correct decision.

LightSquared, on the other hand, either didn't do its homework or intentionally kept quiet in order to fly under the radar and push its initiative through before the GPS user community (and others) knew what was happening. In either case, the GPS user community shouldn't be held accountable in paying for the FCC's and LightSquared's lack of communication/notification.

2. **The FCC needs to consider future GPS signals as well as satellite signals from other satellite navigation systems.** The FCC needs to investigate the affect of the LightSquared system on the future GPS

L1C signal as well as GLONASS L1 (Russia), Galileo L1 (Europe), and Compass L1 (Chinese) to understand the affect on receivers of today and of the future. GPS L1C, Galileo L1, and Compass L1 all use wider bandwidth than today's GPS L1, which makes them even more susceptible to interference from LightSquared's system.

L1 and L5 are the GPS, GLONASS, Galileo and Compass signals of the future. Those signals will drive hundreds of billions of dollars in revenue because they will bring high-precision accuracy to our everyday lives, which is something only available on very expensive GPS receivers today.

Again, precedence has been set. Look at what happened to GPS navigation after Selective Availability (SA) was turned off in May 2000. Overnight, GPS accuracy improved from 100 meters to 10 meters, and subsequently the multi-billion dollar market for GPS automobile navigation devices was launched. Companies like TomTom grew from zero revenue to multi-billion dollar corporations.

The same is expected to happen again when mainstream GPS accuracy improves from 10 meters to well under a meter using the L1 and L5 signals, but that will only occur if the GPS L1, GLONASS L1, Galileo L1, and Compass L1 signals are protected. Some say that L2 can be used instead of L1 in the future. While that's true for GPS, L1 and L5 have become the international standard while L2 is not supported in the international community.

3. **LightSquared mobile devices are potentially portable GPS jammers.** The FCC needs to seriously investigate the interference impact of LightSquared mobile handsets (1626.5-1660.5Mhz) on GPS receivers. It is already known that Inmarsat (1626.5-1660.5MHz) devices and Iridium (1616-1626.5MHz) devices interfere with each

other, but Iridium devices are only used in remote areas so it's not a widespread problem. It is also known that these devices interfere with the GLONASS L1 signal (1597-1605MHz). We don't know the extent of the effect that LightSquared mobile devices will have on GLONASS L1, GPS L1, Galileo L1, or Compass L1 signals. The problem is that no LightSquared mobile phones are available to test. Yes, lab simulations can be performed, but LightSquared devices will be made in Asia, among other places, where the designers won't care one bit about GPS interference. There is not an acceptable design margin, if any, to allow for sloppy LightSquared device designs.

The consequence of LightSquared mobile devices interfering with GPS L1, GLONASS L1, Galileo L1 and Compass L1 is hard to imagine and might be worse than interference from the 40,000 LightSquared towers. Although the LightSquared mobile devices are much lower power (2-3 watts vs. 1,500 watts), LightSquared has announced they intend to deploy more than 250 million mobile devices, which could behave like portable GPS jammers.

Please pay attention this important technical issue that many have chose to ignore.

4. **LightSquared needs to permanently abandon using the upper frequency spectrum (1545-1555MHz) for terrestrial broadcasting.** The idea of LightSquared using their licensed upper frequency spectrum (1545-1555MHz) for terrestrial purpose needs to be permanently abandoned. It's clear from the test results that this causes widespread GPS interference no matter which class of GPS is used.

Finally, I would like to emphasize that the GPS user community should bear no cost as a result of any interference from LightSquared's system. The GPS

230 user community was blind-sided in November 2010. While you can debate
231 whether about the communication between the FCC,
232 MSV/Skyterra/LightSquared, and the U.S. GPS Industry Council, no case can
233 be made that the GPS user community knew of
234 MSV/Skyterra/LightSquared's intentions earlier than late last year, yet the
235 FCC and LightSquared expect the GPS user community to bear the cost of
236 interference caused by LightSquared's system?

237 Furthermore, far too little testing has been completed in order to fully
238 understand the impact of LightSquared's system on GPS receivers. Yes, we
239 have a rough idea of the scale of interference from the test reports
240 submitted in June 2011, but the devil is in the details.

241 Even if LightSquared only uses the licensed lower spectrum (1526-
242 1536MHz), as they've proposed as an alternative, the number of high-
243 precision receivers affected would be at least 200,000 at an estimated
244 replacement cost of \$10,000 per unit which equates to a total equipment
245 replacement cost of \$2 billion dollars. That does not include the cost of
246 removal/installation, lost productivity, required software upgrades, and
247 training. Does the FCC expect the GPS user community to bear that cost?

248 For the above reasons, I recommend that the FCC deny LightSquared's
249 request to proceed and encouraged them to use spectrum outside of the
250 MSS band. The resources expended by Fed/State/Local government and
251 private corporations to vet LightSquared's proposal to use the MSS band
252 has run into the tens of millions of dollars, if not more than a one hundred
253 million dollars. I'm afraid the cost of further vetting will double or triple the
254 expenditure as well as result in tremendous opportunity cost as significant
255 resources are expended by public and commercial entities to continue this
256 debate. Thank you for your attention. If you feel that further testimony is
257 needed, I'm more than happy to oblige.

258 Sincerely,

259 /S/ *Eric Gakstatter*

260 Eric Gakstatter

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